Using Mobile Learning to Enhance the Quality of Nursing Practice Education

Caroline Park
Athabasca University

Richard F. Kenny
Athabasca University

Jocelyne M. C. Van Neste-Kenny
North Island College

Pamela A. Burton
North Island College

Contact Information:

Richard F. Kenny, Ph.D.
Associate Professor,
Centre for Distance Education
Athabasca University
2083 Valley View Drive
Courtenay, B.C., V9N 8L9

Toll-free: 1-888-529-5725
Fax: 1-250-703-2031
Email: rickk@athabascau.ca

Author Information

Caroline Park, R.N., Ph.D., is an Associate Professor with the Centre for Nursing and Health Studies at Athabasca University, where she teaches in the Masters of Health Studies and the Masters of Nursing programs. Besides an interest in hand held devices for learning, she is participating in research relating to inter-disciplinary research teams. Caroline can be reached at: clpark@athabascau.ca

Richard F. Kenny, Ph.D., is an Associate Professor with the Center for Distance Education at Athabasca University, where he teaches instructional design and learning theory. His research interests include instructional design and change agency, emerging technologies to foster higher-order thinking, and mobile learning applications and strategies. Rick can be reached at: rickk@athabascau.ca

Jocelyne M. C. Van Neste-Kenny, R.N., Ph.D., is the Dean of Health, Human Services and Applied Business Technology at North Island College in Courtenay, British Columbia. Her research interests include practice education models, emerging technologies in practice education, and interprofessional education. Jocelyne can be reached at: jvannest@nic.bc.ca

Pamela Burton, R.N., BSN, GNC(C) PIDP, is an instructor with the Collaboration for Academic Education in Nursing Program (Bachelor of Science in Nursing) at North Island College and a Masters of Nursing student with Athabasca University. Her research interests include the use of mobile technologies in nursing education and prevention of medication errors. Pam can be reached at: Pam.Burton@nic.bc.ca

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Abstract

The purpose of this paper is to review the research literature pertaining to the use of mobile devices in Nursing Education and assess the potential of mobile learning (m-learning) for Nursing practice education experiences in rural higher education settings. While there are a number of definitions of m-learning, we accept that advanced by Koole's (2005) FRAME model, which describes it as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction, and use it as a framework to organize this literature. We also report on the initial stages of a project to integrate mobile learning into the Bachelor of Science Nursing curriculum in a Western Canadian college program. Third year students and instructors will be using mobile devices with wireless capability and selected software, such as Nursing decision-making and drug reference programs, during their practice in a community-based course. Course learning activities will be developed to test the use of these devices to support students' access to resources at the point-of-care, to connect to web-based resources, and for peer-to-peer communication. A formative evaluation is planned to determine if the use of mobile learning can be implemented and sustained in an independent learning setting, to assess the appeal of mobile learning use in a real life instructional setting to the target audience, and to judge the effectiveness of the program to enhance reflective practice in Nursing students.

Key Words: Nursing education, practice education, mobile learning, m-learning, FRAME Model

Mobile Learning to Enhance the Quality of Nursing Practice Education

The Promise of Mobile Learning

Wagner (2005) has claimed that the evidence of the widespread adoption in North American society of mobile wireless technology such as cell phones, personal digital assistants (PDAs), laptop computers, and MP3 players, is irrefutable. Researchers (e.g., Hill & Roldan, 2005; Wagner, 2005) refer to current mobile (especially wireless) technology as third generation (3G). By affording the transfer of voice and non-voice data, 3G wireless technologies provide an unprecedented opportunity for inexpensive and beneficial computing power for learners.

Wagner (2005) asks why, with the continuing expansion of wireless networks and improved capacity portable electronic devices, this mobility should not apply to learning. Keegan (2002, 2005) agrees, declaring that the future of distance education is wireless and noting that there has never been a technology that has penetrated the world with the depth and rapidity of mobile telephony. He claims that the challenge for distance educators is to accept this fact and to now develop pedagogical environments for mobile devices.

Is e-learning truly giving way to mobile learning (m-learning) or is the latter merely a subset of the first? What exactly do we mean by m-learning and what does it allow educators to do differently than other forms of teaching and learning? Keegan (2005) defined the term simply as the provision of education and training on PDAs/palmtops/handhelds, smart phones and mobile phones. Trifonova and Ronchetti (2003) agreed, noting that m-learning is often defined as e-learning carried out by means of mobile computational devices and point out that this refers mainly to PDAs and digital cell phones. M-learning could “employ any device that is small, autonomous and unobtrusive enough to accompany us in every moment of our everyday life” (p. 32).

Nyiri (2002) also argues that m-learning is not simply e-learning revisited. He claims that mobile devices will soon become the dominant means of access to the Internet. M-learning will allow learners and instructors to focus on knowledge that is location and situation dependent and interdisciplinary in nature, knowledge arising from practical tasks, and will afford mobile person-to-person communication and reflection in action. In addition, Hill and Roldan (2005) claim that mobile learning is well suited to a Constructivist view of learning which shifts instructor and student roles to a learner-centric model and stresses that knowledge is built from an interplay of action and reflection. Emerging mobile technologies will permit threaded discussions to better emulate face-to-face discussions by delivering discourse in real time to wherever participants are. Similarly, Kukulska-Hulme and Traxler (2005) view the most significant attributes of mobile technologies as their ability to support learning that is more situated, experiential and contextualized within specific domains and to support the creation and use of more up-to-date and authentic content.

Mobile Learning in Health Care Education

The education of health care professionals in the context of a rapidly changing health care system is a prime example of how the mobility of learners within a variety of real life learning environments has posed increasing challenges and where mobile technologies has the potential to support and enhance teaching and learning. The high acuity and pace of practice in institutional environments, combined with an explosion of knowledge and technology, increasingly requires practitioners to access and process clinical data efficiently by drawing on current resources to support safe care and evidence-informed practice at the point of care. Moreover, the shift of client care to the community requires that the education of health professionals take place increasingly in this more autonomous and diverse practice environment where resources are not

readily accessible, where client acuity is increasing, and where more traditional methods of directly observing and working with students are not as feasible. These shifts in practice, along with more limited education and practice resources to support students' practice, raise concern for the quality of their education and the safety of their practice. This is particularly significant for rural practice education where resources are limited and geography poses additional challenges. Addressing these "new age" challenges requires "new age" approaches and tools to support the teaching and learning of health professionals.

The purpose of this paper is to explore the potential of m-learning for Nursing practice education. We will use the FRAME model (Koole, 2005; Koole & Ally, 2006) to review the literature on m-learning in health care, and more specifically, in Nursing practice education. We will conclude with a discussion of how challenges in Nursing education can be addressed with the use of mobile technologies and discuss a pilot project to begin examining this question.

The FRAME Model

Koole (2005; Koole & Ally, 2006) has developed the FRAME model for m-learning and describes it as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction. The FRAME model is represented as an intersecting set of three circles (See Figure 1) representing device usability, learner, and social aspects of learning.

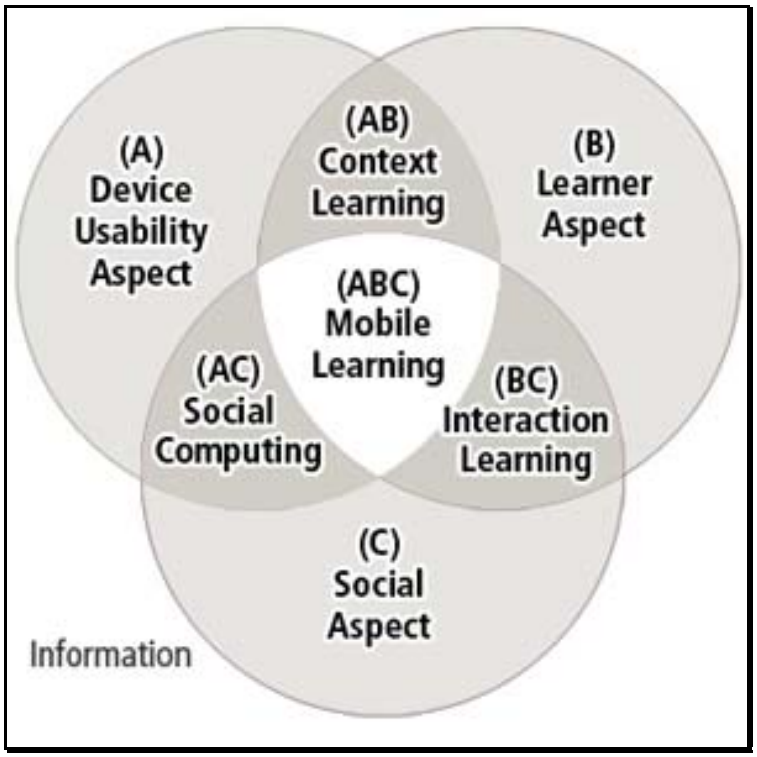

Figure 1. Koole's FRAME Model (reproduced with permission)

Device Usability Aspect

This describes the physical, technical, and functional components of mobile devices, the medium through which mobile learners and mobile community members interact. This interface is both enabled and constrained by the hardware and software design of the devices and can have a significant impact on the physical and psychological comfort levels of the users.

The Learner Aspect

This refers to the individual learner's cognitive abilities, memory, and prior knowledge and those situations and tasks in which a learner needs to succeed. It encompasses the wide range of theories of how learners learn (e.g., Driscoll, 2005; Mayes & de Freitas, 2004) and explains how mobile learning offers an extended environment where learners can interact within their physical and social environments.

The Social Aspect

This aspect refers to the processes of social interaction and cooperation and conveys an underlying thread of social constructivist philosophy. The way in which individuals exchange information affects how groups of people develop knowledge and sustain cultural practices. Communication is seen as a cooperative activity, one accomplished through culturally meaningful signs and symbols. The social aspect has an important role in both the interaction learning (BC) intersection and the mobile-learning process (ABC) itself.

The Secondary Intersections

These contain attributes that belong to each set of overlapping aspects. Those features located inside the secondary intersections of context learning (AB) and social computing (AC) describe the affordances of true mobile devices; that is, what the devices permit in terms of flexibility of learning, information access, psychological comfort, connectivity, and collaboration among learners. The secondary intersection labeled interaction learning (BC) refers to instructional techniques and learning theories.

Context learning (AB). This intersection relates the characteristics of mobile devices to cognitive tasks and to the effective manipulation and storage of information. Highly portable devices permit learners to move with their mobile tools to more relevant or more comfortable locations and can affect the user's sense of psychological comfort and satisfaction by reducing cognitive load and increasing access to information.

The social computing intersection (AC). This aspect describes how mobile devices enable users to communicate with each other and to gain access to other networked systems and information. When people are able to exchange relevant information at appropriate times, they

can participate in collaborative situations that are normally difficult at a distance. This ability to interact is a significant characteristic of learning according to social constructivist philosophy.

Interaction learning (BC). This intersection (BC) focuses on social interaction. Some constructivists hold that learners indirectly negotiate the meaning of materials by comparing their interpretation with that of the author, while others contend that learners interact and *negotiate* meaning with other individuals directly (Smith & Ragan, 2005). The interaction learning intersection is balanced between these viewpoints. Participation in learning communities and cognitive apprenticeships can provide socially based learning environments in which learners can acquire information and negotiate meaning.

The Mobile Learning Process (ABC). All three aspects overlap at the primary intersection (ABC), which represents a convergence of all three aspects and defines the m-learning process. As such, m-learning can afford learners access to a variety of human, system, and data resources, as well as to assist them to assess and select relevant information and redefine their goals (Koole, 2005). M-learning is, however, also constrained by the mobile device hardware and software configurations and dependent upon adjustments in teaching and learning strategies.

The Use of Mobile Learning in Health Care and Nursing: Review of the Literature

While there is evidence of the use of PDAs in field work in education and science (refs), health care practitioners have shown themselves to be early adopters of the technology because of its logical fit with clinical practice.

Experiences with Mobile Learning in Health Care Generally

According to Cahoon, in 2002 the use of handheld devices by clinicians had “exploded” (p. 1) and “clinicians [were] flocking to PDAs (Personal Digital Assistants) and they are pulling

their institutions with them" (p.3). Physicians or physicians in training appear to have been early adopters of this technology. The first noted function was access to pharmacological resources. George and Davidson (2005) state that, in 2003, one-third of Canadian physicians were using hand held devices in their practice. The appeal is size. As Tooey (2003) notes, it can be put in the pocket like a prescription pad and is therefore is not intimidating to the patient. It substitutes for carrying around reference books, laptop computers, calculators, etc.

Much of the medical use of PDA research relates to pharmacology. In a survey of 3,000 online participants (Rothschild, Lee, Bae & Bates, 2002), 78.9% reported that the use of the PDA software, ePocrates Rx, increased their drug knowledge, with 72.3 % reporting at least one positive decision made weekly based on the use of the program. It is important to note, however, that the study was affiliated with ePocrates. Further studies are necessary. Carroll and Christakis (2004) have also noted the potential for industry bias in studies that have been conducted.

The National Coordinating Council Medical Error Reporting Program (as cited in Galt, Rule, Houghton, Young, & Remington, 2005) reports that the most frequent types of medication errors are most likely due to insufficient information at the point-of-care. Galt et al. (2005) compared the potential for drug software to guarantee medication safety with respect to specific, accurate, complete information at the point-of-care. Three software programs met quality indicators for drug information. It was determined that no one program could provide all the information needed. Respondents of a survey of paediatricians regarding use and attitudes of PDAs revealed that, on a Likert scale of 1-5, 4.2 was the mean for those PDA users who believed PDAs had the potential to prevent medication errors. The mean for non-users was 3.8.

Second in number to those investigating the pharmacological use of PDAs are studies examining use of PDAs to connect to online resources. Fontelo, Ackerman, Kim and Locatis

(2003) studied the use of handheld devices by physicians to access MEDLINE and other knowledge sources via wireless connection. Participants were able to access live web casts from two conferences as well as to access PubMed and the http://www.ClinicalTrials.gov website to search for articles. Initial reports found handheld devices to be a “powerful resource in the practice of evidence-based medicine” (p. 147).

One challenge to the use of PDAs in the clinical setting is ensuring security of information. Cacace, Cinque, Crudele, Iannello and Venditto (2004) report on an internal hospital information system project which provided Medicine, Nursing and Dietetics students with hand held devices using private software through an internal WAN. They conclude that the project was valuable in:

> "improving the accessibility to the information system at different levels (students, nurses, physicians) through mobile technologies; improve teaching and learning in the wards through a faster access to clinical data; designing new interfaces for small devices for collecting and examining data at the bedside; a deeper comprehension of security issues; analysis of geographical mobility needs; performance evaluation" (p.4).

Smordal and Gregory's (2003) study of the use of PDAs by medical students was much more specific in relation to some of the technical barriers. They reported that few websites were adapted for PDA screen size, which limited their utility for browsing and interaction. They also note that the transmission of web pages using a GSM (cell phone transmission) connection to PDAs is slow and the cutting and pasting of materials from one application to another was limited. As such, they conclude that these barriers limited the usefulness of PDA's as communication devices and are related to the complexities of infrastructure.

As well, there are studies (e.g., Barrett, Strayer & Schubart, 2004), which report on surveys and interviews of medical residents, to qualitatively understand what they like and dislike and how they used PDAs. The major finding was that most residents used PDAs on a daily basis but that security and HIPAA compliance issues need to be addressed.

Experiences with Mobile Learning in Nursing

Nursing is following suit and we are seeing an increasing emphasis on the use of PDAs by nurses and nursing students in clinical settings. Rosenthal (2003) outlines a number of functions identified by nurses using PDAs: address book, "to do" lists, date book, memo pad, expense tracking, "find" functions, medical references, diagnostic tools, patient student and staff management programs, clinical guidelines, medical dictionaries and lab values . She categorizes these as tools that enhance productivity, promote risk management/error reduction, and through their rapid access to critical information lead to stress reduction.

Cahoon (2002) groups the functions into five categories: clinical services, calculators, data collection, medical record system and content tools. Newbold (2003) notes that if the PDA is also a wireless device, the uses increase in both number and complexity. She lists potential applications such as: interdisciplinary consultations, electronic ordering and test results, patient histories, progress notes and assessments, references, protocols, and prescription information. Increased PDA wireless capacity to include phone and camera capabilities permits rapid chart access, improved workflow, increased time for patients, cost savings, enhanced productivity and, therefore, boosts professional satisfaction.

The utilization of PDAs in nursing practice has not been confined to acute care settings. George and Davidson (2005) note that in both long term care and community based sites, nurses are utilizing the new technology to improve their practices. Community based nurses are using

PDAs to provide patient teaching information and to track patient progress. In describing initial trials with the Nightingale Tracker, Thomas, Feldman and Coppola (2001) stated:

> "each visit can be instantaneously recorded and once sent to the server, can be retrieved back at the office within minutes if necessary. The ability to navigate the Web, show Web sites to the patients, and access teaching plans allows for individualization of care instead of waiting a week or longer for the next visit. Electronically inputting the data immediately and efficiently will decrease longhand recording and free the community nurses to do what they do best - care for clients!" (p.3)

Several authors have outlined benefits and barriers to PDA use. In the literature review for her master's thesis, Davenport (2004) identified 38 barriers and 68 benefits to PDA use. Through a process of mind mapping, she produced six themes in each category, based on a survey completed by nurses. Ranking them in priority she found the following benefits and barriers. The benefits were: a) quick access to current drug database and nursing reference books (highest ranking); b) the ability to manage patients and procedure information, bedside data entry, and data collection for research and teaching (tied for the 2nd, 3rd,and 4th rankings); c) patient health management (ranked 5th); and d) improved team communication (ranked 6th).

Davenport also found the following barriers, ranked by priority: a) the risks of storing confidential patient information; b) the cost of PDAs and ease of loss or damage; c) not enough research on PDA use in nursing; d) difficult to read, e) slow data entry; and f) difficult to understand. These barriers were rated as modest to moderate. In her study of second-degree students entering an accelerated baccalaureate nursing degree, Miller et al. (2005) utilized pre-post and comparative group design to investigate students' use of Palm Operating Software (OS) PDAs. The only risks identified were related to expense of PDA, software and staff support.

In her summary, Davenport (2004) states that "health care organizations have the responsibility to provide the safest possible patient care and that includes the use of the most current, most easily accessed information" [p. 5]. This is supported for nursing education by Altman and Brady (2005):

> "one of the primary goals of nursing education is to provide students with skills to adapt to a rapidly changing healthcare environment. Ours is a world of technology and information management. Hence, one of the essential keys in educating students is teaching them how to be efficient and accurate information gatherers, and apply this process in providing optimal patient care" (p.9).

Experiences with Mobile Learning in Nursing Education

Lehman (2003) identified challenges faced by nursing instructors in the practice setting. She reported using PDAs to keep record of student assignments, checklists for completing physical assessments and as a source of point-of-care reference (drug software). This eliminates the need for carrying hardcopy drug references. Lehman also used the PDA to document student progress on-the-spot. It was reported that previous studies found electronic data to be more accurate than paper documentation.

Miller et al. (2005) conducted a pre-post and comparative study to identify nursing "students' information seeking behaviours and the effectiveness and cost of innovation strategies associated with incorporation of PDAs into students' clinical practice" (p.19). They concur that "through the incorporation of PDAs in undergraduate clinical courses, it is anticipated that the value and skill of seeking current information will become a routine that nursing students take into their professional practice"(p.19).

Due to limitations of the study, authors note that differences among the two groups in seeking information cannot be attributed to PDA use. It was however determined that students utilizing PDAs had increasing numbers of questions when in the practice setting, as well as a greater recognition of the need to use current resources.

Goldsworthy, Lawrence and Goodman (2006) examined the relationships between the use of personal digital assistants, self-efficacy and the preparation for medication administration. Thirty six second-year baccalaureate nursing students were randomly assigned to either a PDA or control group. The authors reported that the PDA group showed a significant increase in self-efficacy.

Stroud, Erkel, and Smith (2005) reported on the patterns of use and demographics of users within nurse practitioner (NP) programs. A 20 item questionnaire was sent to students and faculty in 150 organizations across the US. The 227 returned questionnaires represented 27% of the sample. A high percentage, 67% of those returning the questionnaire, used PDAs, generally to "support clinical decision-making" (p.67). The list of uses and frequency cited is reported in Table 1.

In June 2006, a Western Canadian University's Centre for Nursing and Health Studies polled their nurse practitioner students on PDA use. Two anonymous surveys were built into the course platform,WebCT, "I use a PDA" and "I don't use a PDA", and an email sent to all listed on the program student alias list invited students to choose the appropriate survey and complete it. One hundred and fifty students responded within 5 days; 64 (42.6%) in the "use" category and 86 (57.3%) in the "do not use" category (Author, 2006). The results are reported in Table 1.

[Insert Table 1 about here]

Student NPs in the Author (2006) sample also had a wide range of perceptions of reasons to recommend PDAs to other NPs and of the barriers to use. These are reported in Table 2.

[Insert Table 2 about here]

The relationship between FRAME model and research on mobile learning in Nursing

Effective mobile learning is defined by the convergence of the device usability, learner, and social aspects to extend their impact beyond their natural boundaries. Mobile learning affords enhanced collaboration among learners, ready access to information, and a deeper contextualization of learning. Mobile learning can help learners gain immediate and ongoing access to information, peers, and experts who can help them determine the value of information found on both the Internet and in their real-world environments (Koole & Ally, 2006). The relationship between the FRAME Model and the themes reported in the research literature are shown in Table 3.

[Insert Table 3 about here.]

A number of research articles relating to healthcare professionals use as PDAs focus on the aspect of device usability (e.g., Cahoon, 2002; Newbolt, 2003; Rosenthal, 2003). When selecting a device, all researchers will concern themselves with physical and psychological comfort of the user. Research and development in this area by manufacturers will continue with user input. Healthcare professionals have traditionally carried small booklets and index cards in their pockets, so they are natural early adopters for PDAs as content providers. Students are always in the market for the latest and best, so new innovation permeates the field.

The learner aspect of Koole's FRAME theory is demonstrated by the healthcare professional/students' experience and interaction within the clinical setting, which includes the clients/patients, the facility or home and multiple caregivers. Besides reference content, many

existing tasks such as sending pharmacy and laboratory requisitions have translated to PDAs easily. The ongoing recording of patient information is also facilitated. These activities are documented in the research (Cacace et al., 2006; Thomas et al., 2001). Less, however, is reported on the psychological comfort of the user when carrying out this research using mobile devices. [The Western Canadian] University Nurse Practitioner students used the term “security blanket” and “safer than memory” in their list of reasons to recommend the use of PDAs (Author, 2006). The use of PDAs in medication error research also exemplifies this comfort (Rothschild et al., 2002; Galt et al., 2002). Conversely, a few students felt that a PDA might come between them and the patient/client and lead to the loss of personal touch (Author, 2006).

The Social Computing Intersection is the least explored component. LANs and free or inexpensive wireless connectivity address the physical part of this intersection. Students in both Stroud et al. (2005) and Author (2006) mention email as the only interactional use of the PDAs. We are now interested in the use of PDAs to help to form a learning community. The connectivity potential of these devices for practice and teaching/learning has not been fully explored.

We conclude from this review, that there has been little research on interactional use of PDAs by health care professionals. As well, further research and exploration is required relating to confidentiality and security of data with PDA use. The final issue, cost, will most likely decrease with increased demand and increased wireless capacity.

The Use of Mobile Technologies to Address Challenges in Nursing Practice Education

Changes in health care delivery has impacted nursing practice education and as a result created ideal conditions for the implementation of m-learning approaches. More specifically,

care is moving to the community where client complexity and acuity is increasing and where up-to-date information at the point-of-care is critically needed to support practice. This means that care delivery requires physical mobility throughout the community which does not lend itself to more traditional direct teaching supervision models. As a result, instructors typically supervise twelve to sixteen students at a distance and they must rely on instructional and evaluation that are retrospective in nature. In other words, the instructor is removed from instruction at the point of care and the real-time responsibility for instruction falls on preceptors, or field guides who are often non-nurses, and whose focus is necessarily on service delivery rather than pedagogy. As a result, students are often relegated to an observational role which limits opportunities for their professional development.

As outlined in the FRAME model (Koole, 2005; Koole & Ally, 2006), the social environment is an essential component to the construction of knowledge by the learner. Mobile learning that provides opportunities for connectivity and interaction has the potential to provide the learner with a meaningful learning environment, one in which the learning is situated in a real life context. Timely and rapid access to practice resources (e.g., instructor, peers, information / reference materials, agency information such as policy manuals, agency contact), would better support teaching and learning, particularly when practice takes place in the community where the instructor is further removed from the point of care and where opportunities for student to student interactions are more limited. Not only is connectivity important for learning but it would also support students' safety to practice because of increased decisional resources and guidance. Students' connectedness with instructors at the point of care would also foster support of preceptors/field guides/unit staff and assist students to make more appropriate use of clinicians as clinical experts. This may in turn enhance preceptor's

willingness to work with students as the responsibility for supervising students is shared more equally thereby increasing practice placement capacity. As such, the use of mobile technologies not only has the potential to impact the teaching learning environment for faculty and students but it extends the community of learners to the larger practice context and culture.

The requirement to provide theory and evidence-informed care to clients (College of Registered Nurses Association of British Columbia [CRNBC], 2000) is also challenging in the context of more isolated care in the community and of a rapidly expanding body of knowledge. Access to current knowledge can be problematic for students in the practice setting because of limited access to text resources, computers and connectivity to the internet and library data bases. Although clinicians often have access to such resources, student access has been a problem because of security concerns and minimal infrastructure and support for students in agencies. Moreover, access to resources to support theory and evidenced informed client care becomes even more challenging for students when access is further removed from the point of care.

In keeping with Koole's (2005) FRAME model, access to and usability of mobile learning devices is critical to supporting the context of learning and learning interactions. Carefully planned selection of hardware, software (such as decision-making and drug reference programs), and connectivity options that meets the learner's cognitive, physical and psychological needs in the context of their learning environment is critical in supporting theory and evidenced-informed practice. This is also important in supporting students' safety to practice.

Finally, limited access to technological infrastructures in the community and limits the development of the students' competencies in using informatics in their practice (CRNBC, 2000). Increasingly, practice environments require electronic data retrieval and entry.

Technologies are becoming more mobile and tailored to specific practice environments therefore requiring professionals to develop comfort with a variety of technologies and to make use of transferable informatics knowledge and skills. It is challenging for nurse educators to support students in this development prior to graduation because when access by students and faculty to technologies in the practice setting are limited as outlined above. The integration of m-learning technologies in nursing education programs and more specifically in the practice courses would not only assist the development of informatics competencies but would also ease the graduates' transition to their professional practice in a more seamless manner. The use of m-learning technologies also has the potential to support students in their leadership development as they interact more equally with the interdisciplinary team by using informatics, information management, theory and evidence-informed practice. As such, the development of informatics competencies requires attention to social computing, the context of learning and interactions between learning communities as outlined in the FRAME model (Koole, 2005; Koole & Ally, 2006).

Together, the resulting educational challenges to changes in health care delivery have created an ideal environment for mobile technologies that provide resources for students at the point of care and which enable instruction to be re-introduced in real time.

Next Steps: The Pilot Project

Guided by the FRAME model (Koole, 2005; Koole & Ally, 2006) we have designed a pilot project which will help us to begin to address the address gaps in the literature and challenges in nursing practice education outlined above. Third year Baccalaureate of Science in Nursing students and instructors in a community-based practice course will use pocket computers in the form of PDAs with selected installed software (e.g. nursing decision-making and drug reference

programs) and GSM / GPRS wireless capability in the context of a pedagogical environment and learning strategies for mobile devices. Users will be oriented to these devices and course learning activities will be adapted and developed to test the potential use of mobile devices to support students' access to resources at the point of care, and to test these devices' connectivity potential to web-based resources, instructional supports (i.e., electronic communication among instructors/students/field guides/preceptors), and peer-to-peer learning.

Many authors have reflected on what we can expect the impact of emerging mobile technology to be on learning. When considering the role of any new technology in the teaching and learning process, it is important to exercise extreme caution in attributing direct causal relations. Comparison research on media effectiveness has led to decades of no significance difference results (Clark, 1983, 1994; Russell, 1999) and, while the debate continues (Clark, 1994; Kosma, 1994), it is perhaps more appropriate to consider what new capabilities m-learning can bring to the teaching-learning equation.

As such, this project will situate these technologies within the real life teaching and learning environment of practice and will conduct a formative evaluation based on the FRAME model (Koole, 2005) to assess whether or not the use of mobile learning can be implemented and sustained in an independent learning setting, to assess how the use of mobile learning fits the instructional environment and curriculum design, to assess the appeal of the use mobile learning to the target audience in a real life instructional setting, to assess the instructional design of various learning activities designed to make use of the mobile devices, and to assess the effectiveness of the program to enhance reflective practice in Nursing students.

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Table One

Comparison of PDA use categories.

Cahoon's (2002) Categories	**Nurse Practitioners (Stroud et. al. , 2005 - 227 respondents)**	**Nurse Practitioners (Author, 2006 - 64 respondents)**
Clinical services	To do list (211 respondents) Memo pad (165 respondents)	Pharmacy and lab related
Calculators	Calculator (369 respondents) Expense tracker (12 respondents)	Calculator
Data collection		Keeping up-to-date
Medical record tools	Calendar/date book (605 respondents)	Calendar
Content tools	Patient management tools (224 respondents) Clinical reference materials (751 respondents) Address/phone book (507 respondents) Information exchange via beaming (113 respondents) Games (92 respondents) Recreational reading (17 respondents)	Referring to texts and guidelines studying
	e-mail (38 respondents) Internet access (15 respondents)	e-mail

Table Two

Nurse Practitioner Insights – Author, 2006.

Reasons to recommend	Barriers to use
1. Valuable with right software	1. Cost
2. Lighter to carry than textbooks	2. Lack of knowledge about technology and software
3. Decrease in medication errors, safer than memory	3. No barriers or don't know of any
4. Convenient, useful tool	4. Difficult to set up
5. Information available is immense and valuable	5. No time to learn
6. Back-up quick reference, security blanket	6. Confidentiality issues
7. Concise and easy to transport	7. Technology failures (batteries die)
8. The way of the future	8. Loss of personal touch
9. Looks professional	9. They aren't necessary
10. Can edit & highlight the most important information & add personal notes	10. They don't teach you to be a Nurse Practitioner
11. You can use it to explore options with client	
12. Organizational benefits	
13. Up-to-date information	
14. Aids mobility	

Table Three

The correspondence between PDA uses and Koole's FRAME model.

Cahoon's (2002) Categories	**Nurse Practitioners' Uses (Stroud et. al., 2005)**	**Nurse Practitioners' Uses (Author, 2006)**	**Corresponding FRAME Model Aspects**
Clinical services	To do list Memo pad	Pharmacy and lab related	Device Usability Aspect
Calculators	Calculator Expense tracker	Calculator	Device Usability Aspect
Data collection		Keeping up-to-date	Learner Aspect
Medical record tools	Calendar/date book	Calendar	Device Usability Aspect
Content tools	Patient management tools Clinical reference materials Address/phone book	Referring to texts and guidelines Studying	Learner Aspect
	Information exchange via beaming		Social Computing
	Games Recreational reading		Learner aspect
	E-mail Internet access	E-mail	Social Computing